WHAT IS CLAIMED IS:

1. An optical switch comprising:

an array of side-by-side first optical paths;

an array of side-by-side second optical paths, said first optical paths passing through said second optical paths at intersections;

first and second ports at opposite sides of at least some of said first optical paths for propagating optical signals to and from said first optical paths;

third and fourth ports at opposite sides of at least some of said second optical paths for propagating light to and from said second optical paths; and

a plurality of two-state switching arrangements located at selected said intersections such that each said first optical path includes and is uniquely associated with a single one of said two-state switching arrangements, each said two-state switching arrangement having a transmissive state in which said first and second ports of said uniquely associated first optical path are coupled, each said two-state switching arrangement having a reflective state in which said first port of said uniquely associated first optical path is coupled to a particular said fourth port of a specific second optical path.

2. The optical switch of claim 1 wherein each said two-state switching arrangement is an optical switching unit having a trench, said transmissive and reflective states of each said optical switching unit being dependent upon a presence of a selected fluid in said intersection at which said optical switching unit is located.

3. The optical switch of claim 2 wherein there is a one-to-one correspondence between said optical switching units and said first optical paths and wherein:

said first ports are input ports;

said second ports are drop ports;

said third ports are add ports; and

said fourth ports are output ports.

4. The optical switch of claim 3 wherein said two-state switching arrangements are located at specific said intersections to provide an add-drop switch in which each said add port is uniquely associated with a different output port.

5. The optical switch of claim 4, wherein the number of first optical paths is equal to the number of second optical paths.

6. The optical switch of claim 1, wherein each said two-state switching arrangement is comprised of a first trench and a second trench, each said trench containing fluid responsive to manipulation such that by selectively manipulation of said fluid in said trench each said trench is capable of switching between a reflective state and a transmissive state, each said first trench and said second trench being operatively associated such that said first trench and said second trench are simultaneously in one of a reflective and a transmissive state.

7. The optical switch of claim 6, wherein there is a one-to-one correspondence between said two-state switching arrangements and said first optical paths and wherein:

said first ports are input ports;
said second ports are output ports;
said third ports are add ports; and
said fourth ports are drop ports.

8. The optical switch of claim 7, wherein each said first trench along a particular first optical path is located at said intersection of said particular first optical path with a corresponding one of said second optical paths.

9. The optical switch of claim 8, wherein each said second trench along a particular first optical path is located along said first optical path at said intersection that is adjacent to said intersection at which said first trench of said two-state switching arrangements is located.

10. The optical switch of claim 9, wherein the number of first optical paths is equal to the number of second optical paths.

11. An optical switch comprising:

a plurality of switching arrangements;

N input optical paths having optically aligned waveguides that are operatively associated with a single switching arrangement, each optical path having an input port at a first end and an output port at a second end;

N drop signal paths having first ends at said switching arrangements and having drop ports at second ends, each said drop signal path being operatively associated with a single input optical path with respect to receiving optical signals therefrom;

N add signal paths having add ports at first ends and having second ends at said switching arrangements, each said add signal path being operatively associated with a single input optical path with respect to transferring optical signals thereto; and

a controller for individually switching each said switching arrangement between one of a transmissive state and a reflective state, said switching arrangements being configured such that switching one of said switching arrangements from said transmissive state to said reflective state decouples said input and output ports of said operatively associated input optical path and couples said input port to a drop port of said operatively associated drop signal path.

12. The optical switch of claim 11 wherein each said switching arrangement is comprised of:

a trench having parallel first and second walls;

a fluid within each said trench, said fluid having a refractive index that is similar to a refractive index of said waveguides; and

means for manipulating said fluid within said trenches to selectively switch said trenches between said transmissive states and reflective states, depending upon a presence or an absence of said fluid within said trenches at intersections of said operatively associated first, second and third optical paths.

13. The optical switch of claim 11 wherein each said switching arrangement of an operatively associated input optical path comprises:

a first trench having a wall at a first intersection of said input optical path with said operatively associated drop signal path;

a second trench having a wall at a second intersection of said input optical path with said operatively associated add signal path, both of said first and second trenches having an axis between said first and second intersections;

a fluid within said first and second trenches, said fluid having a selected refractive index; and

means for simultaneously manipulating said fluid within said first and second trenches to selectively switch said trenches in unison between transmissive states and reflective states, depending upon the presence or absence of said fluid at said first and second intersections.

14. The optical switch of claim 13 wherein each said optical path is parallel to and offset from said corresponding second optical path and wherein said intersections of said N drop paths and said N add signal paths with said N first optical paths form a matrix of junctions having dimensions (N+1) x N.

15. The optical switch of claim 11 wherein said input ports and add ports are operatively associated with wavelength demultiplexers and said drop ports and said output ports are operatively associated with wavelength multiplexers.

16. An optical switching arrangement for manipulating optical signals among waveguides on a substrate comprising:

at least three generally parallel first optical paths, each first optical path being formed by a plurality of spaced apart first waveguides;

at least three generally parallel second optical paths, each of said second optical paths being dedicated to exchanging signals with one of said first optical paths, said second optical paths having first ends intersecting said first optical paths;

at least three generally parallel third optical paths, each of said third optical paths being dedicated to exchanging signals with one of said first optical paths, said third optical paths having second ends intersecting said first optical paths;

less than three fluid-containing trenches dedicated to each first optical path, each said fluid-containing trench having a sidewall at an intersection of a specific first optical path with one of said second and third optical paths that is dedicated to said specific first optical path; and

means for manipulating fluid within said trenches such that each said first optical path is limited to being in one of a specific transmissive condition and a specific reflective condition, said fluid enabling propagation of optical signals through said trenches along each first optical path when said fluid resides at said intersections.

17. The switching arrangement of claim 16 further comprising:

input ports at first ends of said first optical paths;

output ports at second ends of said first optical paths;

drop ports at second ends of said second optical paths; and

add ports at first ends of said third optical paths.

18. The switching arrangement of claim 17 wherein each said fluid-containing trench along each first optical path is comprised of a single fluid-containing trench, each said sidewall being located relative to said intersection of said specific first optical path with said dedicated second optical path to reflect optical signals from said specific first optical path to said dedicated second optical path when said single fluid-containing trench has an absence of said fluid at said intersection, each said second optical path being collinear with said corresponding third optical path.

19. The switching arrangement of claim 17, wherein each said first optical path has a dedicated first fluid-containing trench and a dedicated second fluid-containing trench, said sidewall of each said first fluid-containing trench being located relative to said intersection of said first optical path with said dedicated second optical path to reflect optical signals thereto when said first fluid-containing trench has an absence of said fluid at said intersection, each said sidewall of each said second fluid-containing trench being located relative to said intersection of said first optical path with said dedicated third optical path to reflect optical signals thereto when said second fluid-containing trench has an absence of said fluid at said intersection.